IN THE CLAIMS

Please amend the claims as follows:

1. (Previously Presented): A method for analyzing a process performed by a semiconductor processing tool, comprising:

inputting process data relating to an actual process being performed by the semiconductor processing tool;

inputting a first principles physical model including a set of computer-encoded differential equations, the first principles physical model describing at least one of a basic physical or chemical attribute of the semiconductor processing tool;

performing a first principles simulation for the actual process being performed during performance of the actual process using the physical model to provide a first principles simulation result in accordance with the process data relating to the actual process being performed in order to simulate the actual process being performed, said first principles simulation result being produced in a time frame shorter in time than the actual process being performed; and

using the first principles simulation result obtained during the performance of the actual process to determine a fault in the actual process being performed by the semiconductor processing tool.

Claim 2 (Previously Presented): The method of Claim 1, wherein said inputting process data comprises directly inputting the data relating to the actual process being performed by the semiconductor processing tool from at least one of a physical sensor and a metrology tool physically mounted on the semiconductor processing tool.

Claim 3 (Previously Presented): The method of Claim 1, wherein said inputting process data comprises indirectly inputting the data relating to the actual process being performed by the semiconductor processing tool from at least one of a manual input device and a database.

4. (Original): The method of Claim 3, wherein said indirectly inputting comprises inputting data recorded from a process previously performed by the semiconductor processing tool.

5. (Original): The method of Claim 3, wherein said indirectly inputting comprises inputting data set by a simulation operator

Claim 6 (Previously Presented): The method of Claim 1, wherein said inputting process data comprises inputting data relating to at least one of the physical characteristics of the semiconductor processing tool and the semiconductor tool environment.

Claim 7 (Previously Presented): The method of Claim 1, wherein said inputting process data comprises inputting data relating to at least one of a characteristic and a result of a process performed by the semiconductor processing tool.

8. (Original): The method of Claim 1, wherein said inputting a first principles physical model comprises inputting a spatially resolved model of the geometry of the semiconductor processing tool.

9. (Previously Presented): The method of Claim 1, wherein said inputting a first principles physical model comprises inputting fundamental equations as the computer-encoded differential equations necessary to perform first principles simulation for a desired simulation result.

10. (Original): The method of Claim 1, wherein said performing first principles simulation comprises performing first principles simulation concurrently with the process performed by the semiconductor processing tool.

11. (Original): The method of Claim 1, wherein said performing first principles simulation comprises performing first principles simulation independent of the process performed by the semiconductor processing tool.

12. (Previously Presented): The method of Claim 1, wherein said performing first principles simulation comprises using the input data to set a boundary condition of the first principles simulation model.

13. (Previously Presented): The method of Claim 1, wherein said performing first principles simulation comprises using the input data to set an initial condition of the first principles simulation model.

14. (Original): The method of Claim 1, wherein said using the first principles simulation result comprises using the first principles simulation result to detect a fault in the process performed by the semiconductor processing tool by comparing said first principles simulation result with said input data.

15. (Original): The method of Claim 1, further comprising using a network of interconnected resources to perform at least one of the process steps recited in Claim 1.

16. (Original): The method of Claim 15, further comprising using code parallelization among interconnected computational resources to share the computational load of the first principles simulation.

17. (Original): The method of Claim 15, further comprising sharing simulation information among interconnected resources to determine the fault in the process performed by the semiconductor processing tool.

18. (Original): The method of Claim 17, wherein said sharing simulation information comprises distributing simulation results among the interconnected resources to reduce redundant execution of substantially similar first principles simulations by different resources.

19. (Original): The method of Claim 17, wherein said sharing simulation information comprises distributing model changes among the interconnected resources to reduce redundant refinements of first principles simulations by different resources.

20. (Original): The method of Claim 15, further comprising using remote resources via a wide area network to determine the fault in the process performed by the semiconductor processing tool.

21. (Original): The method of Claim 21, wherein said using remote resources comprises using at least one of remote computational and storage resources via a wide area network to facilitate the semiconductor process performed by the semiconductor processing tool.

22. (Original): The method of Claim 1, wherein said performing first principles simulation utilizes at least one of an ANSYS computer code, a FLUENT computer code, a CFRDC-ACE computer code, and a direct simulation Monte Carlo computer code.

23. (Original): The method of claim 1, further comprising:

using the first principles simulation result to classify a fault in the process performed by the semiconductor processing tool.

24. (Original): The method of Claim 23, wherein said using the first principles simulation result to classify a fault comprises:

calculating a set of perturbation solutions corresponding to the first principles simulation for the input data to generate a profile of data solutions to the first principles simulation.

25. (Original): The method of Claim 24, further comprising:

inputting said perturbation solutions to a multivariate analysis;

inputting a difference between said first principles simulation result and said input data to said multivariate analysis; and

utilizing said multivariate analysis to identify a correlation between said input data and said difference.

26. (Original): The method of Claim 25, wherein said multivariate analysis comprises:

a partial least squares analysis.

27. (Original): The method of Claim 26, further comprising:

defining a set of loading coefficients relating tool perturbation data to process performance data, said loading coefficients describing a difference between simulated results and actual results.

28. (Original): The method of Claim 27, wherein said defining comprises:

computing at least one of mean and standard deviation values for the actual results;

generating said loading coefficients based on said at least one of mean and standard deviation values and the simulated results.

29. (Original): The method of Claims 25 or 28, further comprising:

attributing said difference between simulated results and input data to one input data using said correlation.

30. (Original): The method of Claim 1, wherein said using the first principles simulation result to detect a fault comprises:

detecting a fault in at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system, a deposition system, a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

31. (Original): The method of Claim 30, wherein said using the first principles simulation result to detect a fault comprises:

detecting a fault in at least one of a chemical vapor deposition system and a physical vapor deposition system.

32. (Previously Presented): A system comprising:

a semiconductor processing tool configured to perform an actual process;

an input device configured to input process data relating to the actual process being performed by the semiconductor processing tool ; and

a first principles simulation processor configured to:

input a first principles physical model including a set of computer-encoded differential equations, the first principles physical model describing at least one of a basic physical or chemical attribute of the semiconductor processing tool, and

perform a first principles simulation for the actual process being performed during performance of the actual process using the physical model to provide a first principles simulation result in accordance with the process data relating to the actual process being performed in order to simulate the actual process being performed, said first principles simulation result being produced in a time frame shorter in time than the actual process being performed, wherein said first principles simulation result obtained during the performance of the actual process is used to determine a fault in the actual process being performed by the semiconductor processing tool.

33. (Original): The system of Claim 32, wherein said input device comprises at least one of a physical sensor and a metrology tool physically mounted on the semiconductor processing tool.

34. (Original): The system of Claim 32, wherein said input device comprises at least one of a manual input device and a database.

35. (Original): The system of Claim 34, wherein said input device is configured to input data recorded from a process previously performed by the semiconductor processing tool.

36. (Original): The system of Claim 34, wherein said input device is configured to input data set by a simulation operator.

37. (Original): The system of Claim 32, wherein said input device is configured to input data relating to at least one of the physical characteristics of the semiconductor processing tool and the semiconductor tool environment.

38. (Original): The system of Claim 32, wherein said input device is configured to input data relating to at least one of a characteristic and a result of a process performed by the semiconductor processing tool.

39. (Original): The system of Claim 32, wherein said processor is configured to input a first principles physical model comprising a spatially resolved model of the geometry of the semiconductor processing tool.

40. (Previously Presented): The system of Claim 32, wherein said processor is configured to input a first principles physical model comprising fundamental equations as the computer-encoded differential equations necessary to perform first principles simulation for a desired simulation result.

41. (Original): The system of Claim 32, wherein said processor is configured to perform said first principles simulation concurrently with the process performed by the semiconductor processing tool.

42. (Original): The system of Claim 32, wherein said processor is configured to perform said first principles simulation independent of the process performed by the semiconductor processing tool.

43. (Previously Presented): The system of Claim 32, wherein said processor is configured to perform said first principles simulation at least by using the input data to set a boundary condition of the first principles simulation model.

44. (Previously Presented): The system of Claim 32, wherein said processor is configured to perform said first principles simulation at least by using the input data to set an initial condition of the first principles simulation model.

45. (Original): The system of Claim 32, wherein said processor is configured to use the first principles simulation result to detect a fault in the process performed by the

semiconductor processing tool by comparing said first principles simulation result with said input data.

46. (Original): The system of Claim 32, further comprising a network of interconnected resources connected to said processor and configured to assist said processor in performing at least one of the inputting a first principles simulation model and performing a first principles simulation.

47. (Original): The system of Claim 46, wherein said network of interconnected resources is configured to use code parallelization with said processor to share the computational load of the first principles simulation.

48. (Original): The system of Claim 46, wherein said network of interconnected resources is configured to share simulation information with said processor to determine a fault in said process performed by the semiconductor processing tool.

49. (Original): The system of Claim 48, wherein said network of interconnected resources is configured to distribute simulation results to said processor to reduce redundant execution of substantially similar first principles simulations.

50. (Original): The system of Claim 48, wherein said network of interconnected resources is configured to distribute model changes to said processor to reduce redundant refinements of first principles simulations.

51. (Original): The system of Claim 46, further comprising remote resources connected to said processor via a wide area network and configured to facilitate the semiconductor process performed by the semiconductor processing tool.

52. (Original): The system of Claim 51, wherein said remote resources comprise at least one of a computational and a storage resource.

53. (Original): The system of Claim 38, wherein said processor is configured to perform first principles simulation by utilizing at least one of an ANSYS computer code, a FLUENT computer code, a CFRDC-ACE computer code, and a direct simulation Monte Carlo computer code.

54. (Original): The system of Claim 38, wherein said processor is further configured to use the first principles simulation result to classify a fault in the process performed by the semiconductor processing tool.

55. (Original): The system of Claim 54, wherein said processor is configured to classify a fault by calculating a set of perturbation solutions corresponding to the first principles simulation for the input data to generate a profile of data solutions to the first principles simulation.

56. (Original): The system of Claim 55, wherein said processor is configured to:

input said perturbation solutions to a multivariate analysis;

input a difference between said first principles simulation result and said input data to said multivariate analysis; and

utilize said multivariate analysis to identify a correlation between said input data and said difference.

57. (Original): The system of Claim 56, wherein said processor is configured to perform said multivariate analysis as a partial least squares analysis.

58. (Original): The system of Claim 57, wherein said processor is configured to define a set of loading coefficients relating tool perturbation data to process performance data, said loading coefficients describing a difference between simulated results and actual results.

59. (Original): The system of Claim 58, wherein said processor is configured to define a set of loading coefficients by:

computing at least one of mean and standard deviation values for the actual results;

generating said loading coefficients based on said at least one of mean and standard deviation values and the simulated results.

60. (Original): The system of Claims 56 or 58, wherein said processor is configured to attribute said difference between simulated results and input data to one input data using said correlation.

61. (Original): The system of Claim 32, wherein said processor is configured to detect a fault in at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system , a deposition system , a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

62. (Original): The system of Claim 61, wherein said processor is configured to detect a fault in at least one of a chemical vapor deposition system and a physical vapor deposition system.

Claims 63-65 (Cancelled)

66. (Previously Presented): A computer readable medium containing program instructions for execution on a processor, which when executed by the computer system, cause the processor to perform the steps of:

inputting process data relating to an actual process being performed by the semiconductor processing tool;

inputting a first principles physical model including a set of computer-encoded differential equations, the first principles physical model describing at least one of a basic physical or chemical attribute of the semiconductor processing tool;

performing a first principles simulation for the actual process being performed during performance of the actual process using the physical model to provide a first principles simulation result in accordance with the process data relating to the actual process being performed in order to simulate the actual process being performed, said first principles simulation result being produced in a time frame shorter in time than the actual process being performed; and

using the first principles simulation result obtained during the performance of the actual process to determine a fault in the actual process being performed by the semiconductor processing tool.

Claim 67 (Previously Presented): The method of Claim 1, wherein said performing a first principles simulation comprises:

providing for the first principles simulation a reuse of known solutions as initial conditions for the first principles simulation.

Claim 68 (Previously Presented): The system of Claim 32, wherein the first principles simulator is configured to provide for the first principles simulation a reuse of known solutions as initial conditions for the first principles simulation.

Claim 69 (Cancelled)